GPS/INS Flight Testing on the L-29 Delfin

For the
Quarterly Review of the Joint University Program for Air Transportation Research
Friday, October 18th, 2002

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Purpose

- Hardware/software sensor testbed
- Software INS/GPS integration
- Noise versus dynamic tracking error trade off
- Synthetic aperture radar
- Aircraft system id/flight control design educational tool

Flight Test Vehicle

- **L - 29 Delfin**
- **High Altitude 11 Km**
- **High Speed 354 knots**
- **Fully Aerobatic**

Flight Specs Taken From http://aeroweb.brooklyn.cuny.edu/specs/aero/l-29.htm

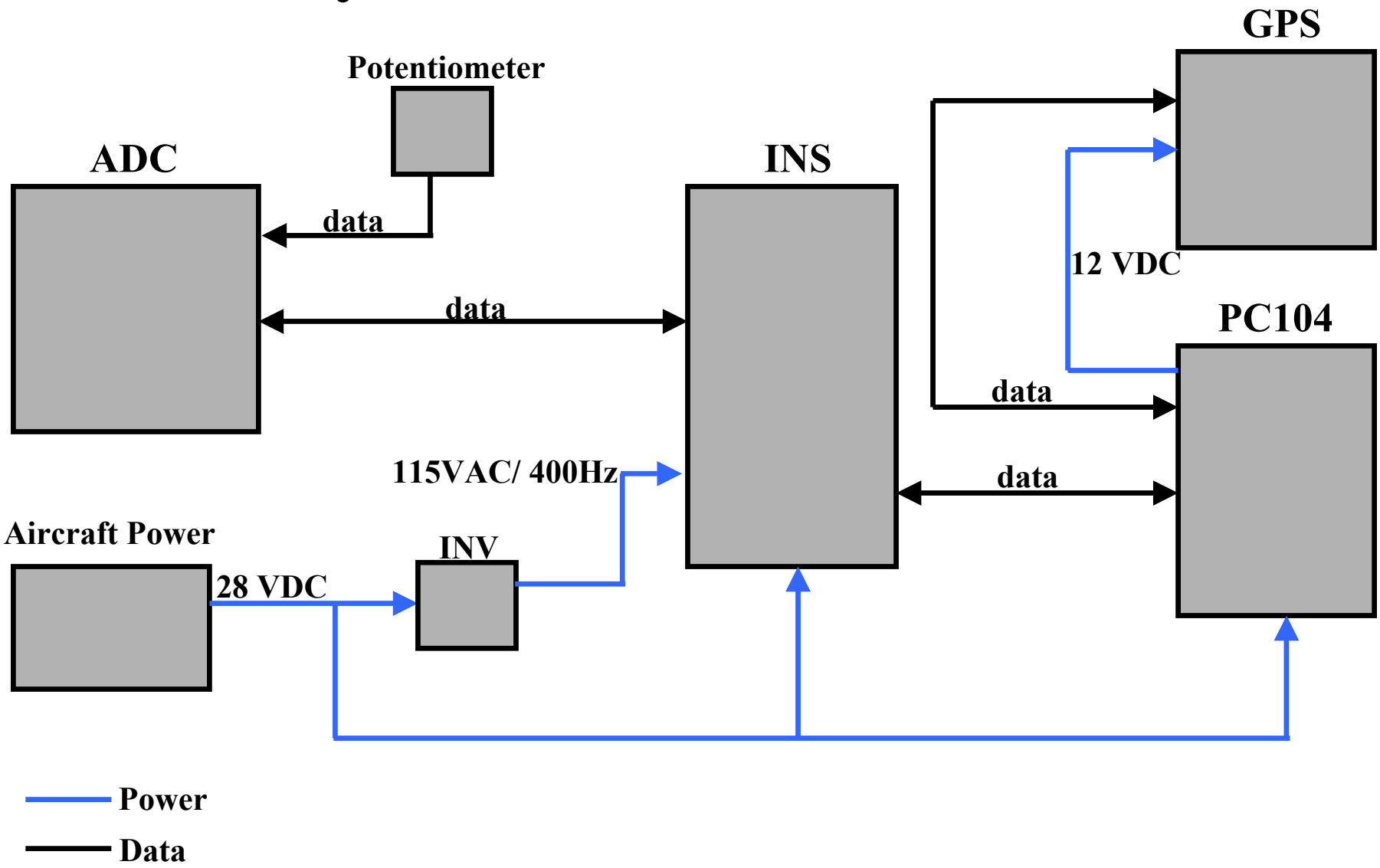
Delphin Equipment

- Navigation Grade INS
- Industrial Keyboard
- Shock-hardened Computer
- Industrial Flat Panel Display
- NovAtel GPS Receiver
- Navigation Grade IMU

Project Development

- Initial equipment installation is complete
- GPS and INS data collected simultaneously in real time
- Previous INS problem solved: the unit needed to know whether it was in the left, center or right position (the unit was designed to be part of a triple-redundant installation)

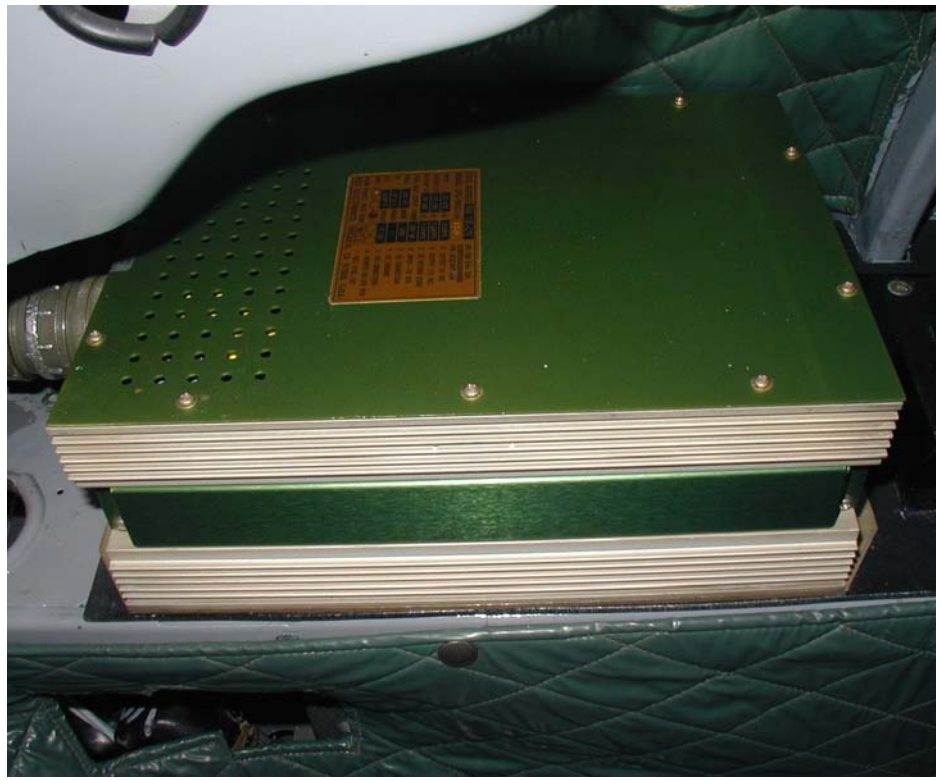
System Block Schematic

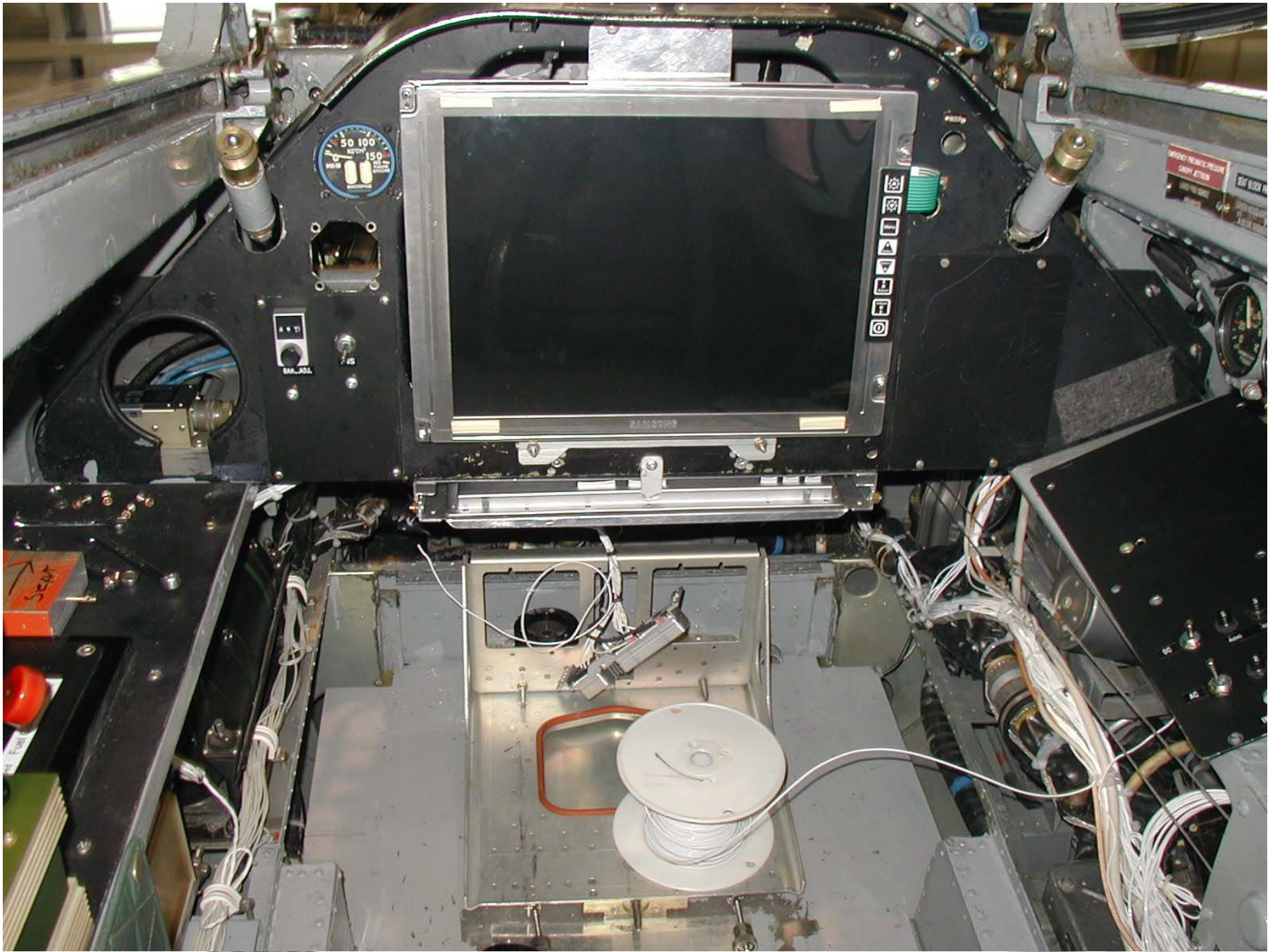


Installed Equipment

ADC

Inverter




50 100
150

Installed Equipment Continued

Industrial Keyboard

INS On Switch

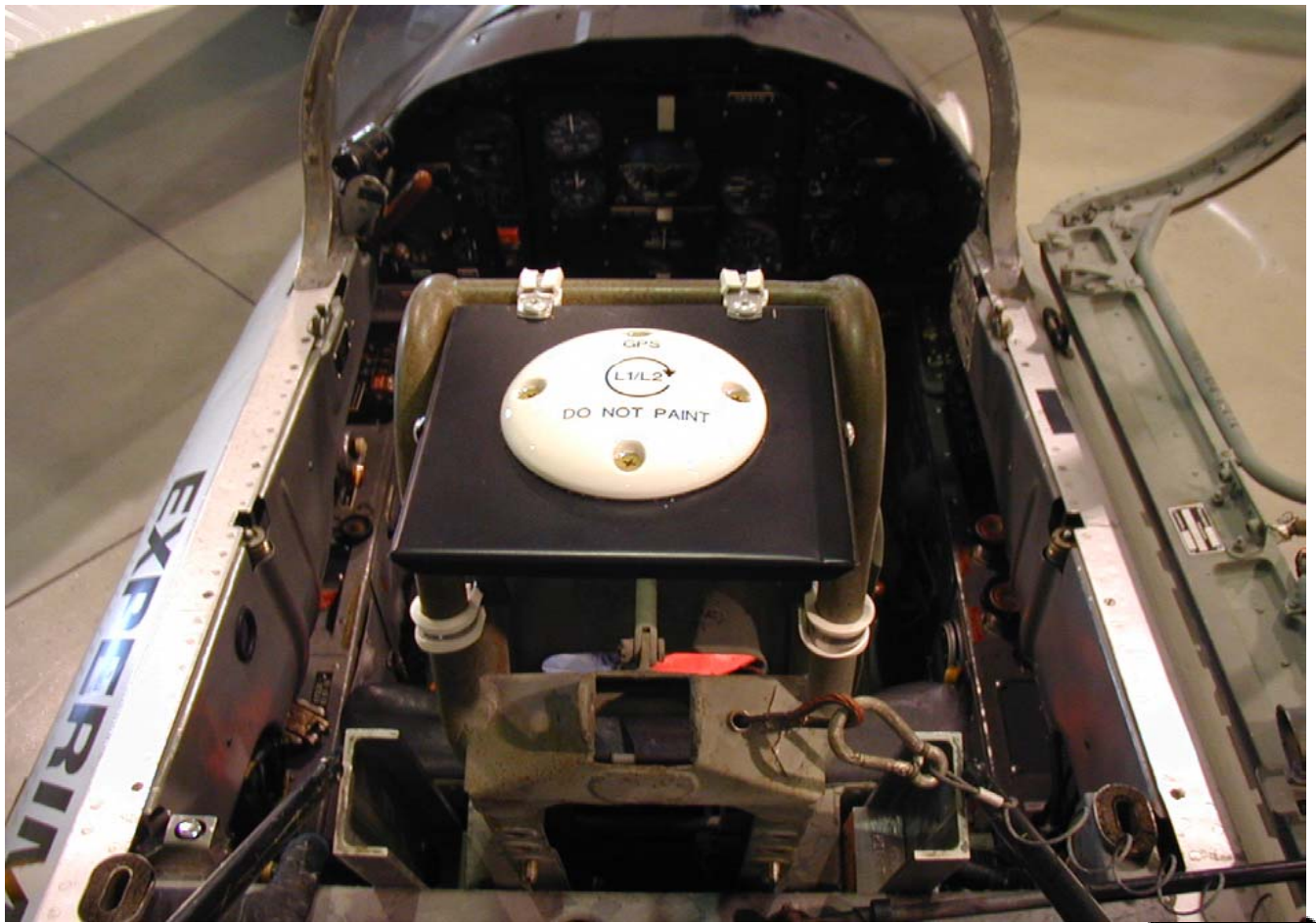
Installed Equipment Continued

Novatel GPS Receiver

Control Switches

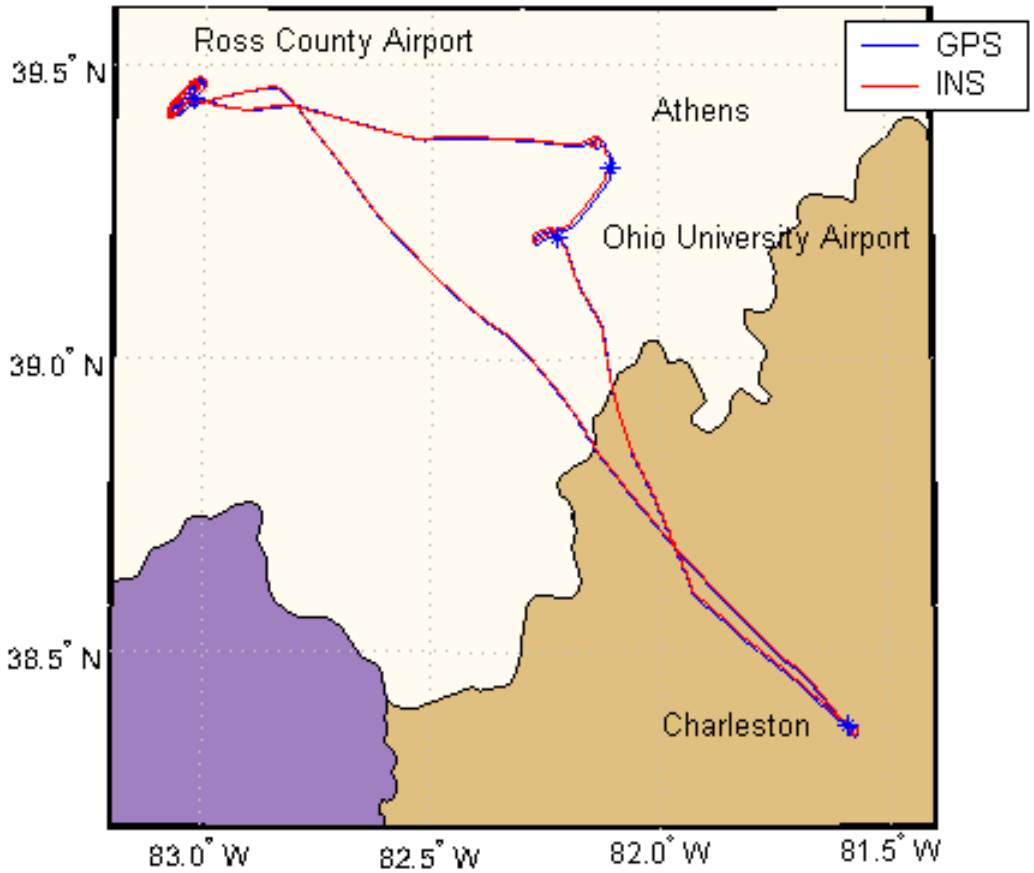
Installed Equipment Continued

GPS Antenna

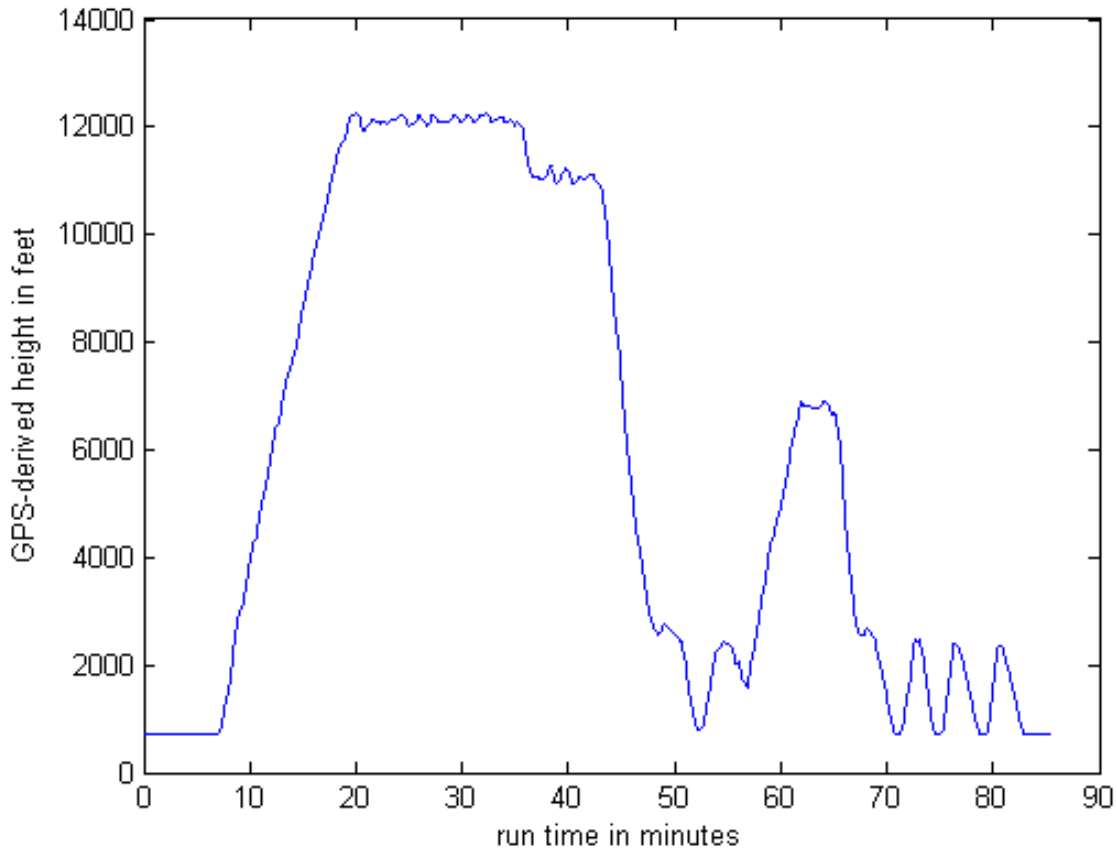


Flight Test – July 17, 2002

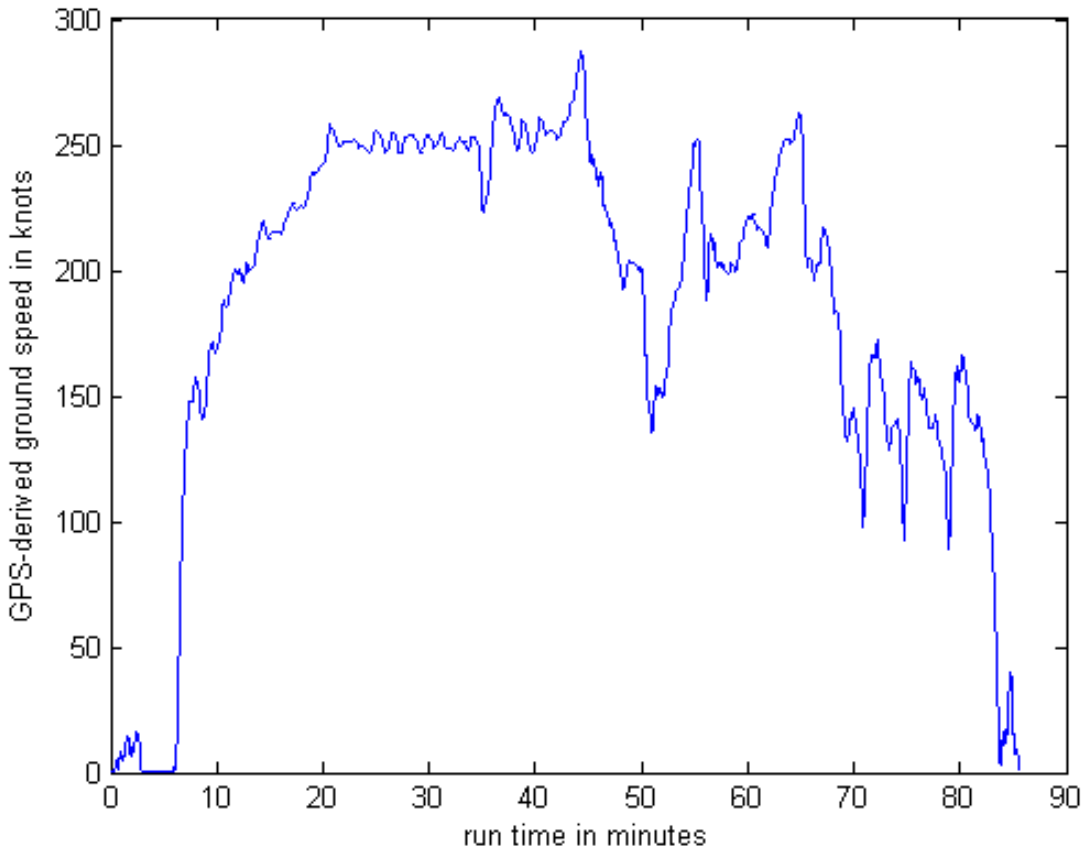
GPS and INS-Derived Profiles



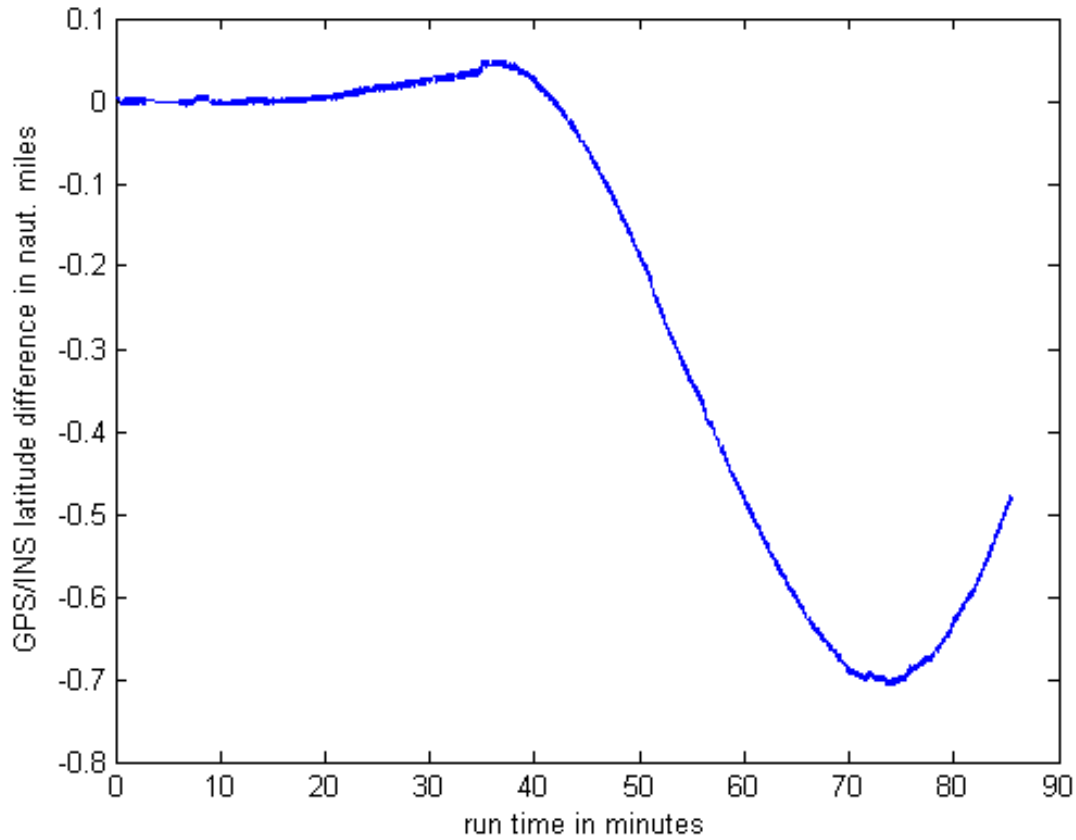
GPS-Derived Height



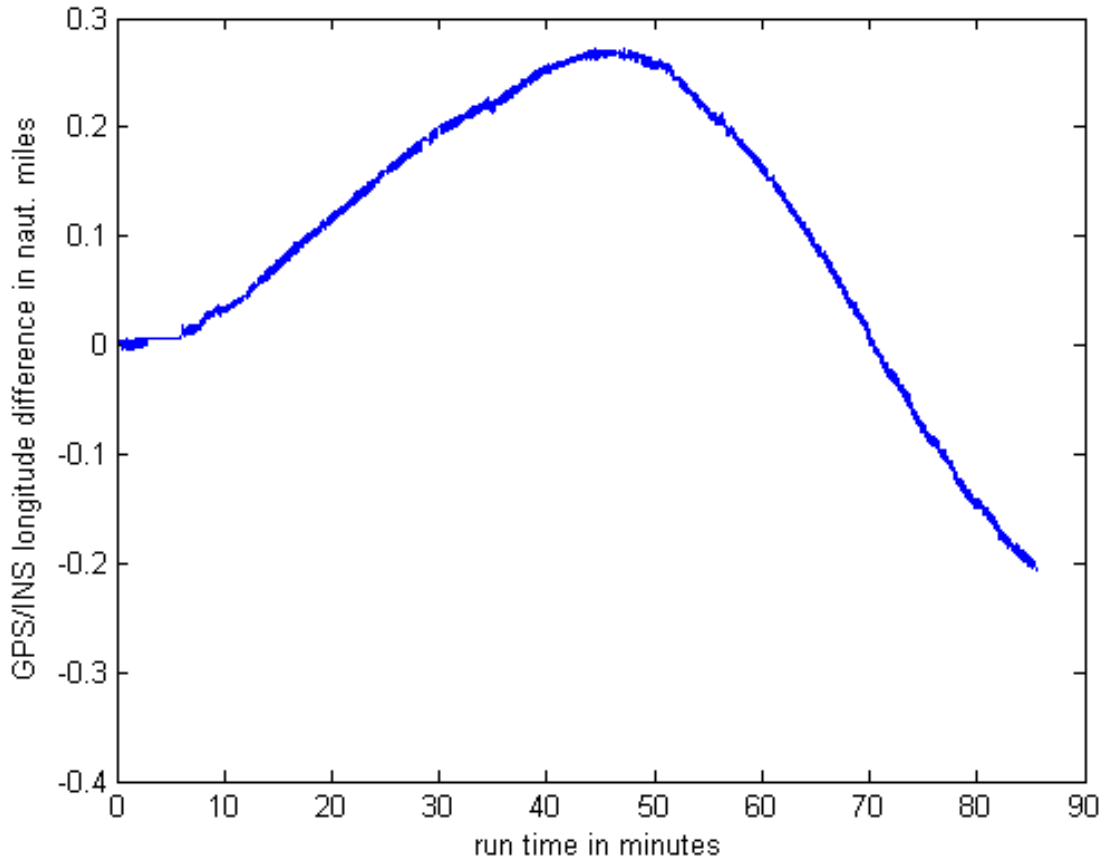
GPS-Derived Ground Speed



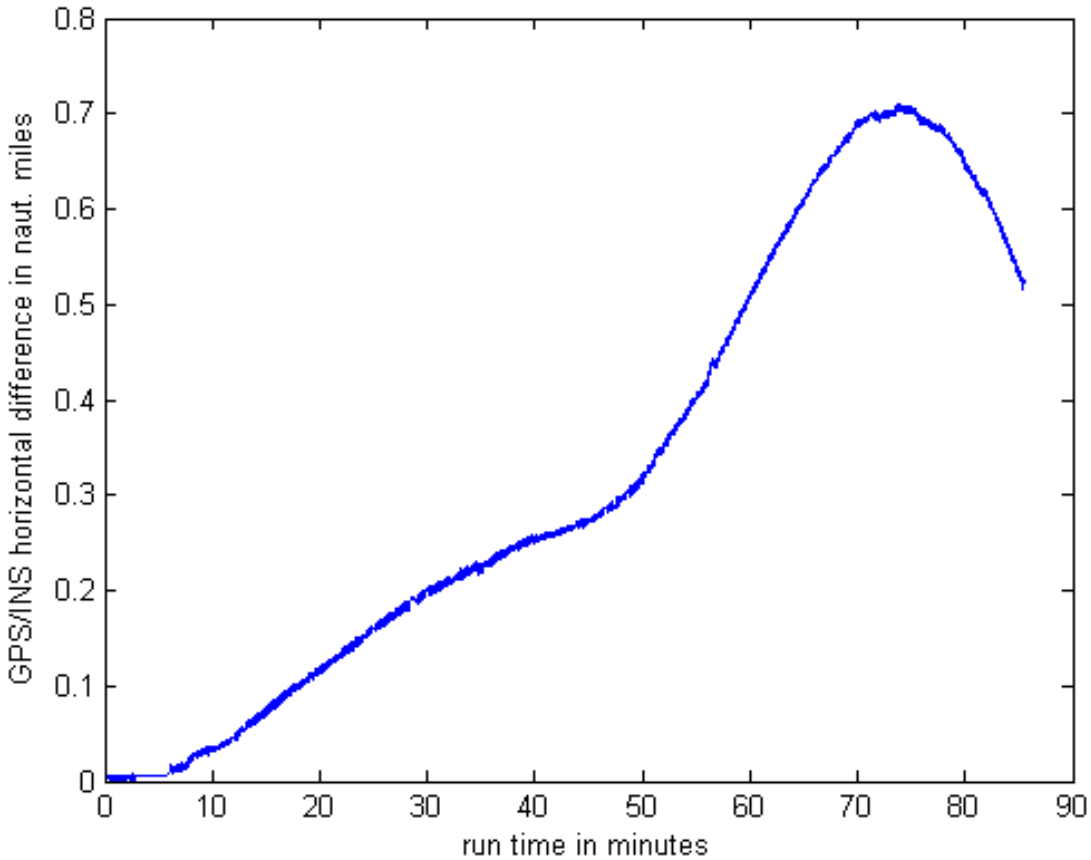
GPS/INS Latitude Difference



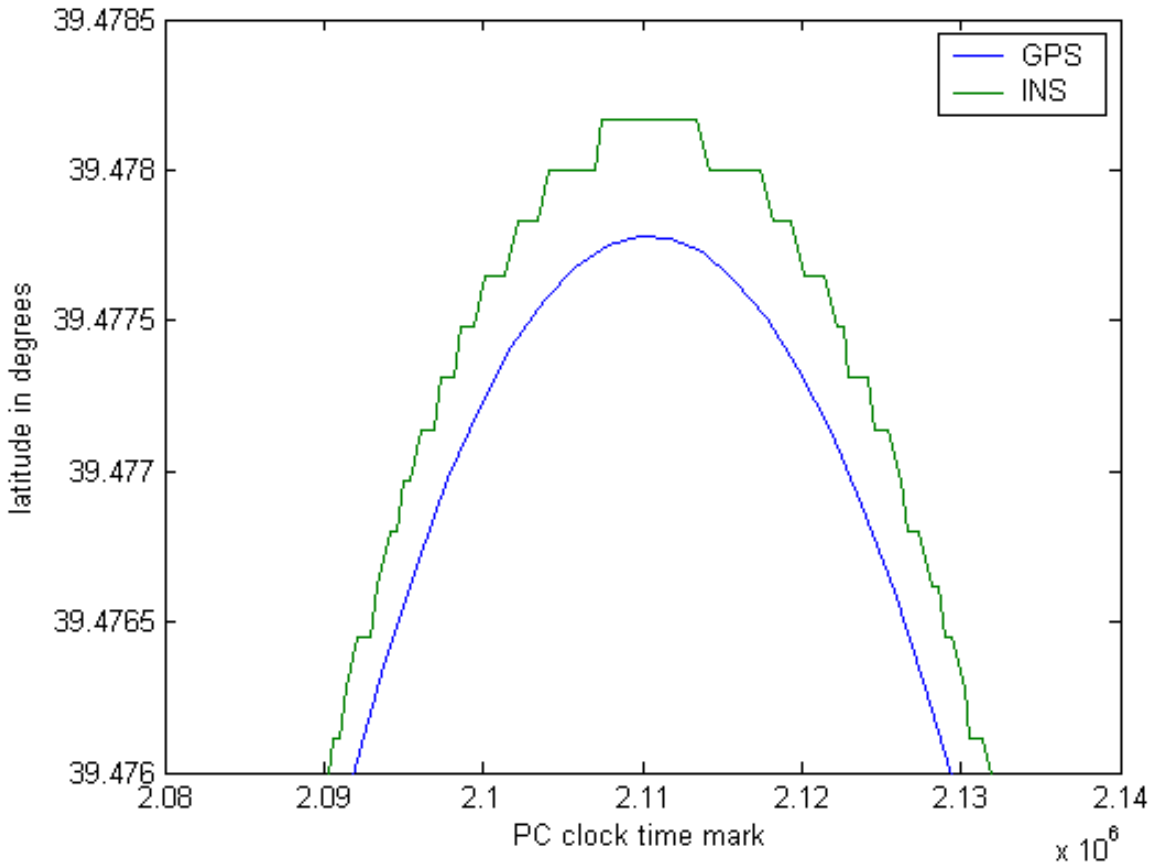
GPS/INS Longitude Difference



GPS/INS Horizontal Difference



GPS & INS Position Resolution



Conclusions

- Difficult to collect high-rate data from multiple sensors with a single PC
- Currently investigating alternative data collection strategies; leaning toward installation of a 2nd PC-104
- Will be working with Frank van Graas to flight test high accuracy GPS velocity determination algorithms (principle application: Synthetic Aperture Radar)

Contact Information

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